Polygraph

VOLUME 29 2000 NUMBER 4

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Published Quarterly
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P.O. Box 8037, Chattanooga, Tennessee 37414-0037

Short Report
Normative Respiration Data for Criminal Cases

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Key words: field cases, normative data, respiration, Zone Comparison Technique

Respiration is one of three response systems monitored with standard field polygraphs. While much has been written and taught within the polygraph community about phasic responses during deception, tonic respiration during polygraph testing has been given only intermittent attention (Ansley, 1999; Sheve, 1972). Basic issues such as the normal range of respiration frequencies, whether there are gender differences, and whether truthtellers and deceivers have different rates has not been definitively answered. These questions are important for instruction of polygraphy, as well as for the detection of certain types of countermeasures.

To answer these questions, we set about examining respiration characteristics in field examinations. We randomly selected a sample of cases from the confirmed case database of the Department of Defense Polygraph Institute (DoDPI). The sample consisted of 234 first-session criminal polygraph examinations. All examinations were conducted according to the DoDPI Zone Comparison Technique protocol. The cases were collected during a 100% review of all criminal polygraph cases conducted by the US Army Criminal Investigations Division files for a 26-month period beginning on January 1, 1995. Ground truth for all cases had been established independent from polygraph decisions. Each case was recorded on an Axciton computer polygraph (Axciton Systems, Houston, TX). Table 1 shows the composition of the ZCT sample by gender and ground truth.

The goal of this project was to investigate the influence of gender and veracity on tonic respiration rates during criminal polygraph testing. It was expected, based on common assumptions in field practice, that females respire more rapidly than males, and that deceptive examinees will have a higher proportion of slow breathers than non-deceptive examinees.

Table 1. Number of deceptive and nondeceptive examinees, by gender.

	Male	Female	Total
Deceptive	141	33	*174*
Nondeceptive	47	13	*60*
Total	*188*	*46*	*234*

Acknowledgements: The authors are very grateful to Mrs. Kay Williams, whose tireless efforts made this project a success. We are also indebted to the statistical support of Dr. Andrew Dollins and Dr. Stuart Senter of the Department of Defense Polygraph Institute, and Dr. John Stern of Washington University. The opinions expressed in this paper are those of the authors, and do not represent or imply the views of the Department of Defense or the US Government. Requests for reprints should be sent to Donald J. Krapohl, PO Box 10342, Ft. Jackson, SC 29207, or by e-mail to dkrapohl@aol.com.

Results

Average respiration rates for the categories of gender and veracity are found in Table 2. A two-way ANOVA was used to test the effects of the examinee veracity and gender. Veracity did not produce a significant effect on respiration rates ($F(1, 233)=0.22$, $p=0.64$). Gender was a significant factor ($F(1, 233)=6.02$, $p=0.02$), but there was no interaction for veracity and gender ($F(1, 233)=.084$, $p=0.77$).

Table 2. Average respiration rates, with standard deviations, for deceptive and nondeceptive examinees, by gender.

		Male	Female
Deceptive	Average	16.56	18.08
	SD	3.89	3.91
Nondeceptive	Average	16.69	18.62
	SD	3.17	4.25

We constructed a 90% confidence interval around the mean rates for the males and females, rounding values to the nearest whole number. With these data, 5% of examinees would exceed the upper limit, and 5% would fall below the lower limit. See Table 3. Since the veracity of the examinee was not a significant factor, the data were collapsed to gender only.

Table 3. Confidence interval of 90% for respiration rates per minute for males and females, rounded to the nearest whole number.

	Breaths per Minute	
	Lower Limit	Upper Limit
Male	10	23
Female	11	25

Since we did not find differences in tonic respiration between deceptive and nondeceptive examinees, we thought it of interest to investigate changes in respiration rates between individual charts for these groups. A change in rate is a factor worth investigating, since it is generally held in the field that large differences in rate between charts often signals deception. Any such trend could easily be obscured by the present use of averages across charts. A post hoc analysis was conducted to examine rate changes between charts 1 and 2, 2 and 3, and 3 and 1.

The 90% confidence interval for changes in respiration rate between charts for nondeceptive cases was 14.1%. In other words, 5% of nondeceptive examinees slowed their respiration 14.1% or more between charts, and another 5% showed an increase of 14.1% or more. As a concrete example, for an examinee breathing at a rate of 15 cpm on the first chart, a change of 14.1% would be either 12.9 cpm or 17.1 cpm. Taken another way, it is statistically uncommon for a nondeceptive examinee to change his or her tonic respiration rate from 15 cpm to, say, 11 cpm from one chart to another chart. For the

deceptive cases, the 90% confidence interval was slightly larger than that of the nondeceptive: 17.5%. Examiners may wish to pay special attention to changes in respiration rates between charts that are unusually large, perhaps greater than 20%. A change of this magnitude between charts does not necessarily signal deception, and should not be considered a decision rule. These are only statistically unlikely behaviors, and warrant an examiner's notice.

Discussion

The finding that tonic respiration rates for deceptive and nondeceptive examinees are not significantly different from one another was unexpected. In the practice of polygraphy, an unusually slow respiration rate (called bradypnea) is often considered a deliberate manipulation by the examinee, and sometimes useful in identifying deceivers. The present data makes clear that the behavior of slow breathing is not unique to either deceivers or truthtellers. As such, in field practice it would be prudent to first determine whether a suspect's breathing rate is genuine or contrived before drawing any conclusions. Even if the tonic breathing rate is being deliberately manipulated by the examinee, that information in isolation is not sufficient to render a decision of deceptiveness or countermeasures. There are other means to make those assessments, and practitioners are directed to the literature relevant to countermeasure detection.

What appears to be meaningful, however, are the very large changes in tonic respiration rates between charts. Because respiration is subject to voluntary control, this pattern is more likely a manifestation of a conscious behavior, not a psychophysiological response, and should be dealt with accordingly. For rounding purposes, changes of about 20% or larger is suggested to trigger these corrective actions, though examiners may choose other thresholds they believe are more appropriate for the conditions of a given examination.

In summary, average breathing rates are different for females and males, but not for deceivers and truthtellers. Very slow or fast tonic respiration rates are not diagnostic in themselves. Examiners should pay attention to examinees who significantly alter the speed of their respiration from chart to chart, especially when the change exceeds 20% between any two charts.

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